

What is claimed is:

1. A terahertz phase shifter based on magnetically controlled birefringence in liquid crystal, the phase shifter comprising:

5 a magnetic field generating mechanism with adjustable direction, the magnet can be rotated around an axis to provide a magnetic field of adjustable direction, thus change the orientation of the liquid crystal molecules in a liquid crystal cell;

10 a liquid crystal cell through which the THz wave propagates, the corresponding reflective refraction index of the liquid crystal will be changed according to the angle of the magnetic field, the equivalent optical path of the THz wave is also changed, thus providing a continuously adjustable phase shift.

15 2. A terahertz phase shifter as recited in claim 1, wherein said adjustable direction magnetic field mechanism further comprising other shape of permanent magnets capable generating adjustable magnitude and direction of said magnetic field.

20 3. A terahertz phase shifter as recited in claim 1, wherein said direction-adjustable magnetic field mechanism further comprising other shapes and configuration of magnets capable generating adjustable magnitude and direction of said magnetic field.

25 4. A terahertz phase shifter as recited in claim 1, wherein said direction-adjustable magnetic field mechanism further comprising other shapes and configuration of electromagnets capable generating adjustable magnitude and direction of said magnetic field.

5. A terahertz phase shifter as recited in claim 1, wherein said multiple magnets combination further comprising implementation of two

or more permanent magnets by adjusting the distance of separation of the magnets to generate adjustable magnitude and direction of said magnetic field.

5 6. A terahertz phase shifter as recited in claim 1, wherein said electromagnets further comprising one or more electromagnet combination, by adjusting the magnitude of the excitation current and/or the angle of the coil to generate adjustable intensity and direction of said magnetic field.

10 7. A terahertz phase shifter as recited in claim 1, wherein said liquid crystal cell further comprising a multiple layer structure, such as a sandwich structure, to provide the adjustable range of phase shift, and keep the stability of the liquid crystal.

15 8. A terahertz phase shifter as recited in claim 1, wherein said liquid crystal cell further comprising the alignment of the liquid crystal molecules which are parallel to the substrate.

9. A terahertz phase shifter as recited in claim 1, wherein said liquid crystal of said liquid crystal cell further comprising any liquid crystals with negative diamagnetic anisotropy.

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